PRACTICAL HINTS FOR ARCTIC TRAVELING.

[A Letter to the President of the Society.]

I am delighted to see, by the newspapers, that there is a probability of the United States government prosecuting Arctic research via Smith sound, a line of route specially American, and made famous by the explorations of Kane, Hayes and Hall, who, with their comparatively ill-equipped and small expeditions, did such noble work; the latter, indeed, having taken his vessel, the "Polaris," within a few miles as far north as the point reached by the English ship "Alert," in the expedition of 1875 and '76, which, notwithstanding all its bolstering up by some able writers, was a failure, if we compare the work done with the programme laid down for its accomplishment.

Having had some experience of sledging, on several very long journeys on the Arctic coast, at an average daily rate of from eighteen to twenty-four miles, and a great deal of practice in snow-shoe walking during a twenty years' residence in the Hudson's Bay Company's territories, perhaps you will permit me to offer a few remarks upon those points where I think the recent English expedition made mistakes, which, although apparently slight individually, amount to a good deal in the aggregate.

In the first place, the men employed on the Nares expedition were, with few exceptions, habituated to a daily ration of grog at or near mid-day, this ration having been doubled for five months of winter, while the men had comparatively little work, except merely walking up and down for a few hours, and hauling ice for water, which was not sufficient to keep their muscles in proper condition for the laborious work of sledge-hauling.

They had a regular allowance of lime-juice on board the ship, which was doubled in quantity for some time before the sledge traveling began, when it was discontinued altogether. Their diet was suddenly changed from the ship-allowance of preserved meat, corned beef and pork, with six ounces of preserved vegetables, pickles and fruit, one ounce of lime-juice, with one gill of rum, to a sledging-ration of pemican-cured bacon, two ounces of preserved potato, one-half a gill of rum, and *no* lime-juice. (See inclosed scales of diet.)

The sledges, with runners about eight inches high and three inches broad, used by the recent expedition, were very objectionable, as they sank deep in snow unless it was very hard packed, and when descending from a hummock of ice, the forepart dove deep into the snow below, giving immense labor to pull and lift it out—labor which the men say was like tearing their arms off.

The best sledge is one resembling the Indian toboggan, but much larger, so as to carry 800, 1,200 or 1,600 pounds, if required, with three runners rounded at the edges, not more than $2\frac{1}{2}$ or three inches broad, and about three-fourths of an inch deep, shod with steel. I consider the best size is a sledge holding about 800 pounds, or a load for four men; because if very difficult ice is to be got over, sledges of this size are much more easily handled, and do not require to be unloaded so often, if at all. The advantages of such a sledge are, that while it runs equally well as the sledge with high runners on the ice or hard snow, it cannot sink more than an inch or so in snow that is not hard packed, and cannot stick when coming down a hummock. It should be made of very tough, light wood, not more than $\frac{1}{2}$ inch thick. Inside the turned-up head is a safe

place for instruments, tins, etc. The runners should be lined with tough steel. I consider that two sledges of four men each are better than one sledge of eight men, for they are much more handy among rough ice or soft snow, and can be moved by the two crews combined without unloading.

The English took chocolate or cocoa for breakfast; a very bad thing, tea being much better, as it keeps away thirst. They stopped about 1½ hours in the middle of each day's journey, to make tea; a mistake which should be avoided, as the men must get very much chilled after perspiring freely. I and my men never stopped longer than three or five minutes at a time, particularly if the weather was cold, during the whole ten or more hours we were traveling, only eating occasionally a mouthful of pemican or a bit of fat. If, however, this plan (which I have always found best) does not suit those who are accustomed to dine about mid-day, let them use extract of tea, by which at least one-half the time of stoppage may be saved, because the water need not be boiled, but merely brought to a sufficient heat to be pleasant to drink.

The English sledge-men used for bedding not only a heavy coverlid, but a duffle-bag for each man, and they also put on a thick duffle "jumper" before going to bed; thus the arms were separated from the body by *two folds* of a thick non-conductor, and each man was kept apart from his neighbor by *four-fold* of this material, so that heat could not be communicated from one to the other. In my own case, we had one covering for all five, with a strip of thin, hairy deer-skin between us and the snow on which we lay. We *took off* our coats, placing them either over or under us, according to taste, and lay as close as we could comfortably pack—I always being one of the outsides, and the cook for the time being, the other. If one of the outsides felt a little cold, the whole party put "about ship," as a sailor would say; that is, turned over on the other side, and thus the part of the body that was previously cold got the warm berth. I may say that I never was uncomfortably cold but once, and that was when the snow-house was made too small, and we had to shove our legs outside. Our whole bedding for five persons weighed between 24 and 25 pounds, or less than five pounds each.

Tents were used on the recent expedition, and are the worst kind of shelter for arctic service, being not only very cold, but having the disadvantage that nearly all the condensed breath and vapor from the hot food adheres to them, not only making the tent heavy and unpleasant to handle, but the least shake causes this condensed vapor to fall down upon the bedding, into which, and if great care is not used, it gets impacted, and aids materially in making it of that "sheet-iron" consistence spoken of by Captain Markham at the meeting of our Geographical Society.

Snow huts are the best shelter in any temperature from 10° below the freezing point to 70° below zero; and if these cannot be built, either from men not knowing how to do so, or because the snow is not sufficiently packed, snow walls should be run up, which is not hard work if properly set about. These walls may be of any thickness most convenient, and should slope inwards as much as possible; should be five or six feet high, counting the depth of space hollowed out by removal of snow for the walls. A piece of sheeting has generally been used as a roof; I should prefer a double fold of thin but strong linen, having between the folds a thin layer of bird's down, which would make this kind of shelter nearly as warm as a true snow hut, which I and my men never failed in building.

Snow-shoes should also be taken on every arctic expedition, and would have been of great use in the recent one, although the officers are not willing to allow as much; at least Sir George Nares has said that heavily loaded sledges cannot be hauled by men with snow-shoes on. In fact, the gallant knight knows noth-

ing about it, probably never having in his life seen a sledge so hauled, yet he gives his opinion with as much confidence as if he had great experience. The snow-shoe best adapted for arctic work should be short, and broad in proportion. There should be different sizes to suit the different weights of the men.

Should it be requisite to build boats to be hauled over the ice, they should be made much broader in proportion to their length than those I have seen.

As regards the sledge-journey poleward, I can only say that it is no wonder little progress was made with the unnecessarily heavy loads* that were dragged by men suffering from scurvy, who, in their weakened state, must have found great difficulty in surmounting obstacles which to healthy and experienced men would have been easy.

There seems, at least, one weak point in Sir George Nares' statement, to the effect that there is no getting a ship nearer the pole, via Smith sound, than the point reached by the "Alert." As early as the 31st of July, 1876, a strong southwest wind drove the ice-pack out to sea to the northeast, and enabled the "Alert" to round Cape Rawson, and run ten miles southward through a fairly open channel until stopped by a heavy floe (*floeberg*) $1\frac{1}{2}$ miles in diameter, which moved off next day northward "with the tide, at the rate of $1\frac{1}{2}$ miles an hour." (See *Nature*, Nov. 9, 1876, p. 43.) The question to be asked is: Where did all this 10 or 12 miles of ice and great floeberg go to? As the ships went northward, the immense fields of ice 100 feet or more thick, to the north, must also have been moving in that direction to make room, otherwise we cannot account for so large a space of open water appearing so suddenly. Probably a day or two of southerly wind might, a few weeks later, have driven the immense piles of palæocristic ice many miles away, and left a clear passage to the north even for ships. At Repulse bay, lat. 66°, long. 32′ N., in 1847, the ice did not clear away sufficiently to allow my boats to get along shore until the 12th of August! It is also probable that the great ridges of ice that looked so formidable, and were so unsurmountable to scurvy-stricken men, with their heavily laden sledges, did not extend very far northward beyond the lat. 83°, long. 20′ 26″ N., reached, or only 25 miles north of the land at Cape Hecla.

I would recommend that no grog be given as an allowance, either on board ship or on the sledging; that men should be chosen who had not been accustomed to a regular ration daily of grog; that a few men should be taken as travelers, who had been used to snow-shoe walking, sledge traveling, setting nets under ice, etc. Such men ought be got, I think, at Winnepeg, among the English half-breeds there, who are as fine fellows as a person could wish for such work as I have named; but probably equally good men may be found in the United States among the western trappers. We hear of naval discipline being necessary in arctic service. I deny this *in toto*. No men could have been more obedient than the men of various nationalities I had on three occasions under me; the cheerfulness with which they did an immense deal of hard work, would have surprised most people, and this, too, without a word of bad language or an oath that could have offended the most delicate lady.

During winter, whenever practicable, the men should be exercised in snow-shoe walking, snow-hut and snow-shelter building; and, if a lake is near, in setting nets under the ice, or perhaps in the sea if there are signs of fish; also in sledge hauling to a sufficient extent to accustom the leg muscles to this particular kind of work. For sometime before starting on the sledge-journeys, the men should in some degree be made accustomed to the sledging diet so as to discover if it agreed with them, although they could not be expected to eat it so readily on board ship as when traveling.

* After the auxiliary sledge returned, loads were more than 400 pounds per man.

The clothes used by the English expedition were much too heavy and *woolly* outside, not keeping out the wind sufficiently. The best coat, in my opinion, is one made of close but not heavy beaverteen, or of thin leather lined with stout flannel, or bath-coating, with as much woolen clothing underneath as a man may, by winter experience, find requisite for comfort. Moccasins made of good moose-skin I consider best for long journeys, with cross-pieces sewed on to prevent slipping. In early winter something water-proof is best, and Eskimo boots are not bad.

I could add a good deal more, but think I have said enough for the present. If there happens to be only one or two of the suggestions I have named thought worthy of adoption, I shall feel myself amply repaid for troubling you with this long and hurriedly written letter. I append some tables of information in compact form.

Believe me, truly yours, JOHN W. RAE.

SCALE OF DIET USED ON THE ENGLISH ARCTIC EXPEDITION, 1875-6.

[Copied from the printed official reports, signed by G. S. Nares, Captain R. N.]

ON BOARD SHIP—*Rations per man per day.*

1 lb. biscuit or soft bread.
½ gill spirits (doubled for the five months of sun's absence).
* ¾ lb. preserved meat, and ½ lb. potted soup, or 1 lb. corned beef or pork.
¼ lb. preserved vegetables.
1 oz. chocolate.
¼ oz. tea.
2¾ ozs. sugar.
1 oz. lime-juice (doubled for some time before sledging).
1 oz. pickles.

For each man per week.

Nearly 1½ lbs. flour, suet and currants.
Nearly ½ lb. split peas.
Nearly ⅛ lb. compressed vegetables.
¼ lb. fruit.
1½ ozs. sugar.
½ oz. mustard.
½ oz. pepper.
Celery seed, vinegar, oatmeal and salt as may be found necessary.

SLEDGING—*Ration per man per day.*

14 ozs. biscuit.
½ gill rum.
1 lb. pemican.
¼ lb. bacon.
1 oz. chocolate.
2 ozs. sugar.
½ oz. tea.
½ oz. tobacco.
⅛ oz. salt.
1-20 oz. of pepper.
¼ oz. onion and celery powders.
2 ozs. preserved potato.
3 ozs. stearine, } for fuel.
1 oz. spirit of wine, }

It will be observed, that when the men were put on the rich, fat food of pemican and bacon, and to very hard work, their lime-juice was discontinued, and they had only 2 ounces of preserved potato instead of 6 ounces of preserved vegetables, pickles and fruit a day.

SCALE OF SLEDGING RATIONS PROPOSED BY JOHN RAE.

1⅛ lbs. pemican.
¾ lb. biscuit.
3-16 lb. preserved potato or other vegetable.

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* Preserved meat and soup issued four days a week.

$\frac{1}{8}$ lb. condensed milk.
$\frac{1}{8}$ lb. preserved cranberries—not much sugar.
Rum, none.
$\frac{1}{4}$ oz. tea.
A small quantity extract of tea most useful, as the water need not boil.
$\frac{3}{4}$ oz. chocolate.
2 ozs. sugar for all purposes.
* 1 oz. lime-juice; onion and celery powder, pepper, etc., if thought requisite.
3 ozs. stearine and 1 oz. alcohol per man for fuel.

The above scale of rations, except that it is much more ample, resembles nearly that used by my small party in 1854. As we had lived during winter wholly on fresh meat killed by ourselves, we required no lime-juice, and carried no vegetables or cranberries—only two ounces of potatoes.

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* This might be carried in flat, tin flasks to hold about three or four days' rations of lime-juice for eight men; they could be placed over the kettle when cooking was going on, which would afford sufficient lime-juice for use each day. The flasks could be thrown away when empty. The lime-juice should be stowed in the ship in jars or casks.